Network Frames Page

Built-in network diagnostics

Thu, Jul 31, 2003

When debugging network communications, it can be helpful to see what network frames a local station has recently processed. The network frames (datagrams) are received into a large (128K bytes) circular network receive buffer. Similarly, network frames are assembled for transmission in another circular frame buffer. A 16-byte record is written into data stream #0 about each frame that is processed by the system software. (Nearly all local stations have this data stream installed already. If it is not, enable this feature by creating `DSTRM` table entry #0 for a data stream called `NETFRAME` and resetting.) The system support for data streams makes this information available to a data requester. The Network Frames page, usually installed as Page F, provides a user interface to access the data from this data stream.

```
 0      F NETWORK FRAMES  07/31/03 1502
 1      NODE<0600> #RCVD=  87 LIST<0509>
 2      NODE=0000 - SIZE>0000 TIME=0000
 3      A610 0034 R E60962 1501:42-08+11
 4      A62F 0042 R E609AA 1501:42-08+13
 5      A611 0042 R E609FE 1501:42-08+16
 6      A9E8 0022 T E8E7DA 1501:42-08+48
 7      A91B 0016 T E8E80E 1501:42-08+48
 8      AB21 0038 T E8E836 1501:42-08+48
 9      A610 0034 R E60A52 1501:42-09+11
10      A62F 0042 R E60A9A 1501:42-09+13
11      A611 0042 R E60AEE 1501:42-09+16
12      A9E8 0022 T E8E880 1501:42-09+48
13      A915 0016 T E8E8B4 1501:42-09+48
14      AB21 0038 T E8E8DC 1501:42-09+48
```

Specify the node from which information about recent network frames is to be collected and interrupt on row 1 to request and capture the data. The number of frame records collected is shown in the `RCVD` field. (It is 87 when the cursor was in the column following the > after the node number; it is 237 when the cursor is elsewhere on row 1.) The filter specs on row 2 restrict the resulting listing by the sending/target node and/or the frame contents size and/or the time (hours and minutes only) received/transmitted. One may use the operators = (equal), `!` (not equal), > (greater than or equal) and < (less than) to specify the filtering logic. Disable a filter by using the value `0000`, independent of the specified operator. One may also enter a `T` or `R` in place of the – to restrict the list to Transmitted or Received frames. The resulting listing, scrollable by pages, starts on row 3.

Interrupt on row 2 to regenerate the listing based upon the captured data and upon any changed filtering options. If the field after the `LIST` prompt on row 1 is nonzero, the entire listing is also written to the serial port of that node.

The list shown includes the node that sent the received frame (or the target node of the transmitted frame), the size of the frame, the `T/R` indicator, the address of the frame in the circular buffer, and the time-of-day the frame was processed. The time-of-day is specified as `HrMn:Sc-Cy+ms` to include the 15 Hz cycle (range `00–14`) and the milliseconds into that cycle. Note that this marks the time that the frame was processed at the task level, not the time of the network interrupt. For a received frame, it is the time that the frame is being processed by the task that was made active in response to the receive interrupt. For a transmitted frame, it is the time that the frame is assembled in the circular buffer and being passed to the chipset for transmission. Thus, the elapsed time between a request frame and a reply frame can be seen as the software turn-around time.

In the case of the example shown above, `node0600`, which is the Linac data server node, is shown receiving some data from contributing nodes to a server data request, then transmitting appropriate reply messages that are due. On 15 Hz cycle #8 at time 1501:42 today, reply data was received from `node0610`, `node062F`, and `node0611`. These three datagrams were received at times 11, 13, and 16 ms past the start of the cycle. Later on, at 48 ms into that same cycle, server replies, which are currently scheduled to be delivered at that time in the cycle, were delivered to Acnet nodes `09E8`, `091B`, and `0B21`, which correspond to `cfss`, `cns27`, and `dae02`. Something similar occurred on cycle #9.

Interrupt on a listing line to change the listing area to show the frame contents itself à la scrollable memory dump. Interrupt again to switch back to redisplay the frame list. This is successful only if the circular buffer, either for received or transmitted frames, has not "wrapped" since the data was collected. Under conditions of heavy network activity, one may have to be quick.

For Acnet header frames, the destination and source node words and the destination task name words are byte-swapped when viewed as received frames. They appear in network order when viewed as transmitted frames.

In 68040-based IRM systems, the contents data starts at the ethernet frame header, which is then followed by the IP header, the UDP header, and the datagram contents. In PowerPC-based systems, such low level information is unavailable; instead, a manufactured 18-byte header appears before the datagram contents. This header includes the datagram size, the source and destination IP addresses and the source and destination UDP port numbers.

This program was recently modified so that the node numbers shown are "friendly" node numbers. See the document entitled *Friendly Node Numbers* for more on this. In the example shown above, the initial `A` in the node numbers refer to Acnet protocol. The other three digits are either the native node number of the indicated node, if any, or an Acnet node number.